

Name: \_\_\_\_\_

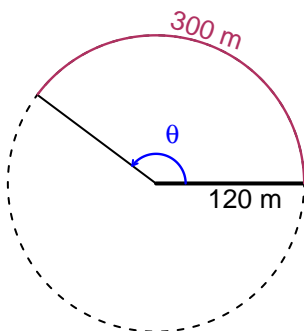
Date: \_\_\_\_\_

## Trig Final (Solution v47)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 120 meters. The arc length is 300 meters. What is the angle measure in radians?

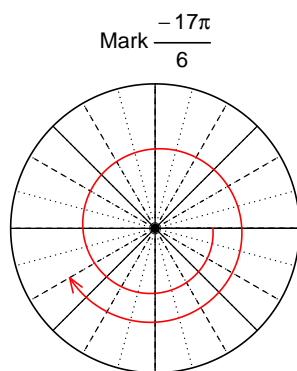


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$\theta = 2.5$  radians.

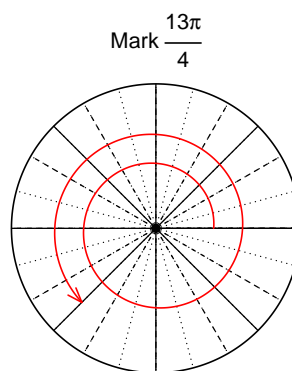
### Question 2

Consider angles  $-\frac{17\pi}{6}$  and  $\frac{13\pi}{4}$ . For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for  $\cos\left(-\frac{17\pi}{6}\right)$  and  $\sin\left(\frac{13\pi}{4}\right)$  by using a unit circle (provided separately).



Find  $\cos(-17\pi/6)$

$$\cos(-17\pi/6) = \frac{-\sqrt{3}}{2}$$



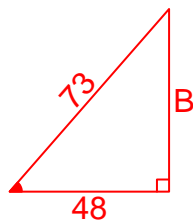
Find  $\sin(13\pi/4)$

$$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$$

### Question 3

If  $\cos(\theta) = \frac{48}{73}$ , and  $\theta$  is in quadrant IV, determine an exact value for  $\tan(\theta)$ .

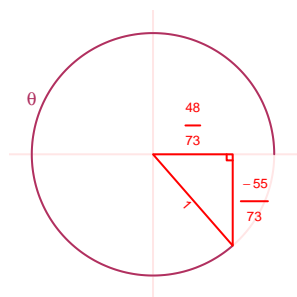
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}48^2 + B^2 &= 73^2 \\ B &= \sqrt{73^2 - 48^2} \\ B &= 55\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-55}{73}}{\frac{48}{73}} = \frac{-55}{48}$$

### Question 4

A mass-spring system oscillates vertically with an amplitude of 6.82 meters, a frequency of 4.66 Hz, and a midline at  $y = 2.24$  meters. At  $t = 0$ , the mass is at the midline and moving up. Write an equation to model the height ( $y$  in meters) as a function of time ( $t$  in seconds).

Any of these equations would get full credit.

$$y = 6.82 \sin(2\pi 4.66t) + 2.24$$

or

$$y = 6.82 \sin(9.32\pi t) + 2.24$$

or

$$y = 6.82 \sin(29.28t) + 2.24$$